

DIAGNOSTICS FOR ION BEAM DRIVEN HIGH ENERGY DENSITY PHYSICS EXPERIMENTS*

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Intense beams of heavy ions are capable of heating volumetric samples of matter to high energy density. We present results from warm dense matter (WDM) experiments at NDCX-I. The 0.3 MeV, 30-mA K^+ beam from the NDCX-I accelerator heats foil targets by combined longitudinal and transverse neutralized drift compression of the ion beam to a spot size ~ 1 mm, and compressed pulse length ~ 2 ns. The uncompressed beam flux is ~ 200 kW/cm², and the compressed pulse fluence is ~ 30 mJ/cm². Both the compressed and uncompressed parts of the NDCX-I beam heat targets. Future plans include construction of the NDCX-II accelerator, which is designed to heat targets at the Bragg peak using a 2-3 MeV lithium ion beam.

We have developed a target chamber and target diagnostics including a fast multi-channel optical pyrometer, optical streak camera, beam transmission diagnostics, and high-speed gated cameras. We compare measurements of temperature, droplet formation and other target parameters with model predictions. We discuss plans and opportunities for diagnostic development and a new target chamber for NDCX-II.

*This work was performed under U.S. DOE Contracts DE AC52 07NA27344 and DE-AC02-05CH11231.